REMARKS

Applicant respectfully requests reconsideration of the application in which claims 13-16 and 18-30 are currently pending. Applicant notes that claim 13 is the sole independent claim and that each of the other pending claims depends therefrom. Applicant is addressing the specific rejections with respect to claim 13 and respectfully submits that the dependent claims are in condition for allowance based at least on their dependency from claim 13.

35 USC 102(e) rejection on Hwang US2004/0161575 as evidenced by Arnone WO 00 75641 (US6828558 used as a translation)

Applicant respectfully submits that Hwang, with or without Arnone, does not teach or disclose the invention recited in claim 13 and in particular does not teach or disclose the recitation of:

> ***wherein the mask layer provides an effective aperture upon a gate beam*** *having a power ranging from about five milliwatts to about 10 milliwatts being directed at the optical disk, and wherein the nanoparticles are configured for increasing a local field intensity*

Further, as stated in the prior amendments, Hwang does not describe the dielectric materials in the mask layer as comprising a non-linear optical material.

With respect to the dielectric material, Applicant notes that the prior Office action relies on the assertion that Hwang mentions ZnS, and that Arnone mentions that ZnS has non-linear properties. But, to excite the nonlinear properties of ZnS, however, higher laser intensity is needed than as envisioned in Applicant's optical disk invention. In Arnone's patent, ZnS functions as an emitter crystal to generate THz pulse when it is excited by a visible laser pulse. In this type of situation, it is common practice that femto-second (fs) or pico-second(ps) laser pulses are necessary in order to excite the nonlinearity of the emitter material. These pulses have intensity on the order of GW/cm^2. As stated in the reference Krauss et al., Femtosecond measurement of nonlinear absorption and refraction in CdS, ZnSe, and Zns," Applied Physics Letters, 65 (14), 3 October 2004, the nonlinearity of ZnS was measured and shown that about $1GW/cm^2$ intensity is needed to excite the nonlinearity of the ZnS at 610nm and about $50GW/cm^2$ intensity is needed at 780nm. In Hwang's case, as reported in paragraph [0040], Experiment example 1, increased C/N was achieved when using only 4mW laser power (P) at wavelength (lambda) 635nm with numerical aperture (NA) 0.6. This corresponds to a laser intensity of about $0.36MW/cm^2$ (calculated using $P/(lambda/NA)^2$). The laser intensity is at least 3 orders of magnitude smaller than the laser intensity needed to excite the nonlinearity of ZnS.

That is, the claim elements taken together as a whole preclude the use of the ZnS in the mask layer to achieve the non-linear functionality regardless of non-linearity being possibly achievable under a different set of operating parameters in a different application.

In claim 13, the nonlinear property of the matrix material in the mask layer has active functionality, as described in Applicant's paragraphs [0011] and [0025]-[0028]. Changing the refractive index of the matrix material due to its nonlinear response to a laser beam enables the resonance of the nano-particles. Due to the nonlinear response, the effective beam size is reduced to gain an "aperture-like" benefit to achieve higher resolution; and the nano-particles additionally enable a local field enhancement (which improves the signal level).

Applicant notes that the Examiner response to the above arguments was as follows:

> The applicant argues that ZnS does not exhibit non-linear optical properties at the intensities used in the Hwang reference. The applicant uses Krauss et a!. as evidence for this claim. However, the examiner notes that Hwang uses powers within the range recited in claim 13 and also Krauss et al does not disclose the non-linear behavior of ZnS in a composite film comprising ZnS having nano-particles embedded therein. Further, the examiner notes that claim 13 does not recite intensities for the gate beam and therefore embrace embodiments where the intensity of the gate beam can be outside of the range held by the applicant to be the range in which ZnS exhibits non-linear behavior.

Applicant continues to respectfully disagree. Applicant submits that when the Hwang laser power is within the range of 10 mW and the Hwang intensity is thus in the range of $1 MW/cm^2$, the Hwang intensity is not enough to excite the nonlinearity of ZnS (which requires ~ $1 GW/cm^2$). Therefore, Hwang does not appear to teach using the nonlinearity of the matrix material. Even if somehow combined, Hwang and Arnone will not produce what Applicant has recited in claim 13 because the nonlinearity of ZnS will not be excited using the laser power condition in Hwang.

35 USC 103(a) rejection on Hsu in view of Katsuragawa JP07-114048 (USPTO translation provided), Hwang, and J. Tominaga, T.Nakano or N. Atoda: Applied Physics Leatters. 73 (1998)2078.

Applicant respectfully submits that the applied references, either individually or in any combination, do not teach or disclose the invention recited in claim 13.

The Office Action states that Hsu does not teach a mask layer comprising nanoparticles embedded in a non-linear optical material and states that

> Hwang et al. disclosed that a silver oxide film is dissociated into silver particles and oxygen upon recording (0012, 0029). Silver oxide has been used as a masks layer in super-RENS optical discs (0011).

Tominaga et al. disclosed that an Sb film is a non-linear optical film (abstract). In the reference Sb is used as the material of a mask layer. The antimony film is sputtered and therefore is a layer entirely of Sb particles of various sizes, the other particles forming a matrix.

Katsurgawa et al. teaches a non-linear Aluminum oxide film having Fe, Co, or Ni hyperfine particles embedded therein (0005). The result of adding these hyperfine particles is a film having increased non-linear susceptibility $X^{(3)}$ (0005). Also note that this replaces the media of the type described by lida et at. at {0002].

It would have been obvious to one of ordinary skill in the art to modify the mask layer taught by Hsu et at. by using the masking layers of either Katsuragawa et at. JP-07-l 14O48(English translation provided) ,Hwang et al. 2004/0161575, J. Tominaga, T. Nakano or N. Atoda: Applied Physics Letters. 73 (1998)2078 with a reasonable expectation of forming a useful optical recording medium with a masking layer.

Applicant notes that the mask layer in Hsu may have either nanoparticles (silver oxide) **or** nonlinear matrix (Antimony). However, Hsu does not describe having both. As Applicant interprets the Office Action, the examiner has suggested it would be obvious to modify Hsu by adding nano-particles in order to aiming to enhance nonlinearity of the film. While this may or may not work, this is still does not teach or suggest Applicant's claim 13 recitation of

*wherein the mask **layer provides an effective aperture upon a gate beam** having a power ranging from about five milliwatts to about 10 milliwatts being directed at the optical disk, and wherein the nanoparticles are configured for increasing a local field intensity.*

Therefore, even if the references were combined, the elements of Applicant's claim 13 would not be taught or suggested.

35 USC 103(a) rejection of claims 13, 19-20, and 22 lida EP 0 580 346 in view of Kester US5266365 and Woundenberg US5872882

Applicant respectfully submits that the applied references, either individually or in any combination, do not teach or disclose the invention recited in claim 13.

As stated in Applicant's prior amendment in response to an earlier 35 USC 102 type rejection on lida, in lida the semiconductor nanoparticles are not embedded into a nonlinear optical material (instead the particles appear to be added to the mask material to create the non-linearity) and are not described relative to increasing local field intensity.

In response to Applicant's prior remarks, the Examiner has replaced the 35 USC 102 rejection with the current 35 USC 103(a) rejection and the following remarks:

lida teaches a high density optical disk 2, shown in figure 3, consisting of a substrate 13, a shutter layer 17 formed on the substrate, and a recording film 18 formed

on the shutter layer. Recording pits are formed on the recording layer by shining tight through the substrate and the shutter layer and onto the recording layer. The shutter layer 17 tightens the irradiated beam for information reproduction or recording allowing for a high-density medium. The shutter layer comprises semiconductor fine particles in a glass or resin matrix. The particle size of the semiconductor fine particles is from 0.1 to 50 nm and preferably from 0.5 to 30 nm(nanoparticles). Therefore the semiconductor fine particles are nanoparticles. **Resins such as polymethyl methacrylates, poly carbonates, polystyrenes, amorphous polyolefins, and epoxy resins can be** used(claim 22). The particle density affects the properties of the shutter layer and should be at least 1 mol% and should not exceed 80 mol %(3/1 1-41). The recording layer may be a thin film of an organic dyes such as cyanine or phthalocyanine(claim 19). Function of the shutter layer is disclosed at (4/14-26). The wavelength of the light beam for information reading or writing in the optical disk 310 to 890 nm and the composition of the shutter layer is chosen in accordance with the wavelength actually employed.

The bolded portion shows that the shutter layer comprises metal particles embedded in a glass or resin matrix. Resins include polymethyl methacrylates, polycarbonates, polystyrenes, amorphous polyolefins, and epoxy resins.

Woudenberg teaches non-linear optically active (NLO) polycarbonates and the use of these polycarbonates in waveguides(abstract). The NLO polycarbonate is disclosed at (2/15-67).

Kester et al. teaches epoxy polymeric non-linear optical materials having enhanced stability and good NLO properties(abstract). Description of these NLO epoxy polymeric materials can be found at (3/29-4/3).

It would have been obvious to one of ordinary skill in the art to modify the shutter layer comprising nano-particles embedded in a resin matrix taught by lida et at by using the non-linear epoxy polymeric materials taught by Kester et at. or the non-linear polycarbonates taught by Woudenberg as the material of the resin matrix based on the disclosure in lida to use epoxy resins or polycarbonate resins and with the reasonable expectation of success. Further, one would expect that by using a non-linear material as the matrix material that the non-linear susceptibility of the resulting film would be increased.

Applicant respectfully submits that, the Examiner is basically making a similar argument as the above discussed rejections regarding by combining references from different sources to produce a seemingly equivalent “Nonlinear matrix” + “nanoparticles” mask layer. However, what Applicant recites and what the examiner is arguing are not the same and no combination cited in this rejection would teach or suggest

*wherein the mask **layer provides an effective aperture upon a gate beam** having a power ranging from about five milliwatts to about 10 milliwatts being directed at the optical disk, and wherein the nanoparticles are configured for increasing a local field intensity.*

Additionally, it appears that excitation of the materials of Iida would seem to require a light intensity well beyond what is typically used in a optical data storage system.

Summary

Accordingly, Applicant respectfully requests the withdrawal of the rejections of claim 13, be with drawn and that the rejections of claims 14-16 and 18-30 which depend therefrom additionally be withdrawn by virtue of their dependency.

Applicant respectfully requests that a timely Notice of Allowance be issued in this case. Should the Examiner believe that anything further is needed to place the application in better condition for allowance, the Examiner is requested to contact Applicant's undersigned representative at the telephone number below.

Respectfully submitted,

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